Prevalence of foodborne pathogens in rural pigs and in derived cold pork meats - preliminary report

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Introduction

The "rural" breeding of one or two pigs and their domestic slaughtering is a significan reality in the Veneto Region, as a consequence of an ancient tradition still surviving in th countryside.
In the eastern part of the Venice Province, about 2.500 rural pigs are bred and slaughtered ever year in the period between November and February.
Many data are available on industrial breeding and processing, whereas very little is known abou the prevalence of foodborne pathogens both in live animals and in derived food, mainly sausages salami and cold pork meats.
The present paper shows the preliminary results of a project during which about 400 samples ar collected at different steps: faeces, muscle and lymph nodes during slaughtering, fresh sausage just after sacking and fermented salami at the end of the seasoning period.
Samples are examined for several parameters, including bacteria (*Enterobacteriaceae Salmonella*, *Listeria monocytogenes*, *Campylobacter* spp., β-glucuronidase-positive *Escherichi coli*, Lactic Acid Bacteria, Coagulase-positive *Staphylococci* and Sulphite-Reducing Clostrides) an parasites (*Trichinella* spp., *Giardia duodenalis*, *Cryptosporidium* spp and others).
The aim of the research is to define: 1) the pathogens prevalence during breeding, 2) the hygieni conditions during slaughtering and processing, mainly considering pathogen carry-over effects and 3) the microbiological profile of sausages and salami, the latter being conditioned by prope seasoning practices and environmental contamination.
The research will continue involving microbiology laboratories of the local hospitals since we woul like to know if any case of illness due to foodborne pathogens was detected and recorded moreover we will collect data about products (ingredients, salt percentage, use of preservatives.. and processing (temperature, drying conditions, seasoning conditions...) to know the relationship between these conditions and pathogen prevalence in pork products.

Material and methods

Samples are processed in San Donà di Piave and Padua Parasitology Laboratories.
Almost all deliveries are composed of the following samples: faeces and mesenteric lymph node taken during slaughter and a fresh sausage produced usually in the same day of slaughte another sample of fermented salami, belonging to the same lot of the previous samples, ar delivered after 60-70 days of seasoning.
In total, 70 faeces, 70 lymph nodes, 70 diaphragms, 69 fresh sausages, 12 seasoned salan samples were examined.
Salami were examined for the following parameters: *Salmonella* spp. (ISO 6579:2002/Cc 1:2004E), *Listeria monocytogenes* (ISO 11290-1:1996/Amd 1 2004), *Enterobacteriaceae* (IS 21528-2:2004), Sulphate-Reducing *Clostridia* (ISO 7937:2004), *Campylobacter* spp. (FDA BAM Lactic Acid Bacteria (internal method), β-glucuronidase-positive *Escherichia coli* (ISO 1664 2:2001), Coagulase-positive *Staphylococci* (ISO 6888-2:1999 Amd 1 2003), Inhibitory Substance Research (only from fresh sausage, DM 10.03.1997).
Diaphragms were examined for the detection of *Trichinella* spp. (magnetic stirrer method fc pooled sample digestion, according to Regulation 2075/2005).
Lymph nodes and faeces were examined for the detection of *Salmonella* spp. (in 25 g), *Listeri monocytogenes* (in 25 g) and *Campylobacter* spp. (in 25 g).

pH was measured in all fresh sausages.
62 faecal samples were examined by flotation technique and modified Zhiel-Neelsen staining for gastrointestinal parasites, and *Cryptosporidium* oocysts. For 50 sample an Immunofluorescence (IF) kit (Merifluor, Meridian) for both *Giardia* cyst and *Cryptosporidium* oocysts was performed too.

Results

8 faeces samples (11,4 %) were positive for *Campylobacter* spp., (in 5 cases *Campylobacter coli*); 2 samples (2,8 %) were positive for *Salmonella* spp. (*Salmonella derby* and *Salmonella typhimurium*); *Listeria* spp. has never been detected.
25 faecal samples (40%) were positive for gastrointestinal parasites, in particular 15 (24.2) for coccidia, 9 (14.5%) for ascarids, 5 (8.0%) for trichurids and 4 (6.5%) for gastrointestinal strongyles. 7 animals showed mixed infection of 2 or more parasites. *Giardia* cysts were found in 5 animals (8.2%); 13 animals were found positives for *Cryptosporidium* oocysts at the stained smears, but only 8 of them (13.11%) were confirmed by IF.
5 lymph nodes samples (7,3%) were positive for *Campylobacter* spp. (1 *Campylobacter coli* and 1 *Campylobacter jejuni*). 2 samples (2,9 %) were positive for *Salmonella* spp. (1 Salmonella derby). No samples were positive for *Listeria monocytogenes*. 2 samples were not examined due to the small quantity.
All diaphragm samples were negative for *Trichinella* spp.
Fresh sausage samples (69) showed a *Enterobacteriaceae* count between 0 (7 samples) and 39.000.000 CFU/g; a Coagulase-positive *Staphylococci* count between 0 (6 samples) and 12.000 CFU/g; a β-glucuronidase-positive *Escherichia coli* between 0 (25 samples) and 910.000 CFU/g; a Sulphate-Reducing *Clostridia* count between 0 (40 samples) and 840 CFU/g. Lactic Acid Bacteria were counted between 270 and 1.300.000.000 CFU/g.
Salmonella spp. and Campylobacter spp. were not detected in any sample (in 25 g) while *Listeria monocytogenes* was detected in 1 sample (1,4%).
Inhibitory Substances have never been detected.
In all samples, pH values of fresh sausages ranged between 5.0 and 6.3.
Fermented salami samples (12) showed a *Enterobacteriaceae* count between 0 (5 samples) and 3.900 CFU/g; a Coagulase-positive *Staphylococci* count between 0 (8 samples) and 280 CFU/g; a β-glucuronidase-positive *Escherichia coli* between 0 (8 samples) and 4.000 CFU/g; a Sulphate-Reducing *Clostridia* count between 0 (9 samples) and 250 CFU/g. Lactic Acid Bacteria were counted between 67 and 500.000.000 CFU/g.
Salmonella spp. and *Campylobacter* spp. have not been detected (in 25 g) in any of the examined fermented salami; 2 samples (16,7%) were positive to *Listeria monocytogenes*.
In all samples, pH values of fermented salami ranged between 5.1 and 6.1.

Discussion

Even if only a few number of fermented salami has been examined (many of the others are still seasoning) preliminary results showed hygienic situation of alive rural pigs and derived meats.
Some pathogens (*Salmonella* spp., *Campylobacter* spp.) were detected in faeces and lymph nodes but not in derived products.
This is probably due to good hygienic practices during slaughtering and processing.
Enterobacteriaceae and β-glucuronidase-positive *Escherichia coli* reduction during seasoning says that this phase is, in most cases, correctly done.
In other situations this did not appear, probably as a consequence of not appropriate processing and seasoning conditions (temperature, humidity).
Listeria monocytogenes presence in fermented salami is probably linked to a high water activity value, due to a low salt content or to a short seasoning period.
It will be important, by the end of the research, to correlate the presence of *Listeria monocytogenes* to these products and process characteristics.

Conclusions

Notwithstanding the research is not concluded, pathogens presence at different stages of production outlines the importance of continuing the exam of other samples.

According to the final results, HACCP principles will be used to establish where a CCP phase can help operators to avoid the risk of *Listeria* and other pathogens in final products.
For each CCP, critical limits will be set, i.e.: salt percentage in the recipe, use of microbial starter cultures, seasoning conditions: time, temperature, humidity...
All these factors will be adequately considered since environmental conditions cannot be completely controlled since these products are usually stored in private basements and not in refrigerating rooms.

References

Commission Regulation (EC) N° 2075/2005 of 5 December 2005 laying down specific rules on official controls for *Trichinella* in meat.